Making Sense of a Round World on a Flat Surface

Summary

Enduring Understanding: Students will understand the world in spatial terms
Essential Question #1: Why is it so hard to make a map that is accurate in both size and shape?
Essential Question #2: How can I find my way from where I am to where I want to go?

Time Frame

2 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning, Communication, Social & Civic Responsibility, Employability

Materials

Materials Needed: globe beach ball, overhead projector, overhead slides of map projections (masters included with this lesson Plan) Scissors, tape, grid paper (master included with this lesson plan) an orange for each work group, cone template (included) and a water-soluble marker.

Background for Teachers

The teacher needs a basic knowledge of map reading and basic certification in Geography.

Student Prior Knowledge

The student needs no prior knowledge. This is beginning level instruction.

Intended Learning Outcomes

Explain the differences between major types of map projections.
Examine characteristics of maps and globes such as latitude, longitude, great circle routes, cardinal directions,compass rose etc.
Explain map concepts including rotation, revolution, axis, seasons, solstice, equinox, and the earth/sun relationships
Collect and interpret geographic data using maps, charts, population pyramids, cartograms, remote sensing and Geographis Information Systems (GIS)

Instructional Procedures

Vocabulary words:

- Mercator projection
  : A map projection designed on a cylinder wrapped around the world.
- Conic projection
  : A map projection designed from a cone placed over the globe.
- Moll wide projection
  : A map projections based on an oval representation of the world.
- Flat plane (oblique) projection
  : A map projection designed on a flat plane touching the globe at one point such as the north or South Pole.

- Robinson's Projections
  : An oval map projection with a flat top and bottom, which is a compromise between the size and shape distortions.
- Great circle route
  : The shortest distance between any tow points on earth.
- Distortion
  : Distortions in size and shape of countries on a map which results from representing a curved world on a flat surface.
- Cartographers
  : Cartographers are people who make maps and charts describing the world.
- Grid system
  : The pattern of lines that circle the earth north and south, east and west.

Pass out an orange to each group. Let each work group (small group no more than three students) experiment to cover the orange with a flat piece of grid paper. Have each group display their solution.
Ask students to describe what happened to the squares at the top and bottom of the paper.
Have the students wrap the orange with the cylinder of grid paper. Ask if this is a better solution.
Have the students wrap the orange with a cone of grid paper. Ask if this is a better solution.
Display on the overhead the map projections and explain how cartographers have tried to solve this problem.
Discuss the advantages and disadvantage of each map projection. On the beach ball globe with the water-soluble marker draw a straight line horizontally from Philadelphia, Pa to Lisbon, Portugal. Draw the great circle route on the globe beach ball. Discuss why the great circle route is shorter.
List on the Overhead several careers that involve the use of maps. Have the students select two careers they would like to explore. In two days the student will bring a description of those careers.
Have the students use the 5 sentence paragraph format to write a paragraph describing why it is necessary to understand map projections and how they are used for those two professions.
Wrap up: Have the students unwrap the orange, peel the orange and share the sweet success of wrapping the world in a map.
Assessment: Given four map projections students will be able to identify each projection by name and give an advantage or disadvantage of each.
Essential Question #2: How can I find my way from where I am to where I want to go.
Key words: Maps, Latitude. Longitude, Map Grid, Compass Rose
Divide the class into small groups ad play the Find Mr. Patterson Game. Students may ask questions that may be answered with yes and no to find my locaation. Winning group will win a Snickers candy bar.
Vocabulary words:

- Latitude
  : Imaginary lines draw on a globe or map east and west with which to measure distances north or south.
- Longitude
  : Imaginary lines drawn on a globe or map north and south from the north pole to the south pole to measure distances east and west.
- Compass Rose
  : A symbol on the map which shows the directions on the map north and south; east and west.
- Cardinal Directions
  : The directions of east, south, north and west on a map.
- Intermediate Directions
  : The directions of northeast, southeast, southwest, and northwest on a map.

- Map Grid
  : Perpendicular lines on a map used to find a location on the map. These lines are also called lines of latitude and longitude.
- Prime Meridian
  : An imaginary line running from the north pole to the south pole through the city of Greenwich, England at o* from which all distances east and west are measured.
- International Date Line
  : An imaginary line from the north pole to the south pole at 180* at which a new day begins.
- Equator
  : An imaginary line running around the earth at the center (widest area) of the earth from which all distances north and south are measured.
- Legend
  : An area of the map which defines the symbols used on the map.
- Relief Lines
  : Lines on a map which show the difference in altitude from the bottom of a land form to the top of a land form. These lines are also known as contour lines of a topographical map. Relief on a map may also be shown by changes in color.
- Time Zone
  : An area 15* wide or the distance that the sun will travel across the earth in one hour.
- Magnetic Grid Declination Mark
  : A symbol on a map which shows the difference between True north, Grid North and Magnetic North.
- True North
  : The point on a map directly under the North star.
- Grid North
  : The point on a map at which all the grid lines converge at the north or south of a map.
- Magnetic North
  : The point on the earth to which the campus needle points.
- Scale
  : Using one measurement compared to another unit of measurement to determine distance on a map. For example: l inch = l Mile

Class Activity 1: 45 Minutes

On a piece of paper have students make a grid with 8 lines vertically and 8 lines horizontally. Using this grid the students will number the lines from top to bottom of the paper with numbers. The students will label the lines from left to right with letters. Use this grid to draw a map of the class room and list the grid address of 5 friends on the classroom map. The student will draw a compass rose showing the cardinal directions north, south, east, and west.

Class Activity 2: 20 Minutes

scale: How long is a nanosecond or l billionth of a second. It is to quick to see on a clock. If we set up the right scale of measurement we may still be able to see a nanosecond visually. Pass out to each student a piece of paper 11 1/4 inches by ½ inch. Have the student write nanosecond on the paper and explain that this is how far light will travel in 1 billionth of a second. By using the measurement of inches and comparing it to l second we can see how long a nanosecond is. On maps we do the same thing by comparing inches to miles. If we draw a map full scale where a mile = a mile, the map paper would be as large as the area covered. By reducing the size using a scale we can draw a map that is accurate yet easy to hold and handle.

Have the students find the scale on the map they are using and measure the distance between two points. With a scrap piece of paper have the student put the corner of one edge of the paper on one

location. Then along the edge of the paper mark the distance to the second location with a pencil. Then move the edge of the scrap paper down to the scale and calculate the distance in air miles from one location to the other location.

Class Activity 3: 30 minutes

Given a map the students will identify on the map the terms listed in the vocabulary section. A state road map is a good map to use for this activity.

Class Activity 4: 45 Minutes

Latitude and longitude: On a world map have students find the lines of latitude. Notice that the latitude lines begin at the equator and move north and south with the degrees increasing towards the poles. Find the longitude lines. Notice that 0* longitude is located at Greenwich, England, home of the Royal Geographic society. Longitude lines move around the world from east to west beginning with 0* or the prime meridian. The world map may be divided into quarters of NE, SE, SW, NW to simplify the process.

See Diagram Below

To find latitude and longitude of a location start at the equator and read up or down for the latitude and right for the longitude Beginning at the equator and the prime meridian.

Assessment of knowledge: Find the location of the following lat. - long. Coordinates on a United States map. (locations rounded off to nearest degree)

34* North 118* West Los Angeles, Ca 40* North 105* West Denver, Co 26*North 80*West Miami, Fl 30* North 90*West New Orleans, La 41*North 112* West Salt Lake City, Ut

Strategies for Diverse Learners

Slower students should be assigned to groups with good students and be peer tutored by the better students.

Assessment Plan

Assessment of knowledge: Find the location of the following lat. - long. Coordinates on a United States map. (locations rounded off to nearest degree)

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The students will draw a map of the class room listing the location address of five friends.

Students will locate the distances between their city and five other cities in the state using the map scale.

The students will pass a vocabulary test on this lesson vocabulary. (passing average to be determined by the teacher)

Bibliography

USGS.gov

Authors

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